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EXAMINER
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JAGAN, MIRELLYS

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**BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES**

Application Number: 10/699,399  
Filing Date: October 30, 2003  
Appellant(s): GUHA ET AL.

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Jon Gibbons  
For Appellant

**EXAMINER'S ANSWER**

This is in response to the corrected appeal brief filed 12/23/08 appealing from the Office action  
mailed 12/4/06.

**(1) Real Party in Interest**

A statement identifying by name the real party in interest is contained in the brief.

**(2) Related Appeals and Interferences**

The Examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

**(3) Status of Claims**

The statement of the status of claims contained in the brief is correct.

**(4) Status of Amendments After Final**

The Appellant's statement of the status of amendments after final rejection contained in the brief is correct.

**(5) Summary of Claimed Subject Matter**

The summary of claimed subject matter contained in the brief is correct.

**(6) Grounds of Rejection to be Reviewed on Appeal**

The appellant's statement of the grounds of rejection to be reviewed on appeal is substantially correct. The changes are as follows:

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“Whether claims 17 and 18 are unpatentable over *Davidson* (US 6,140,141) in view of *Paniccia* (US 6,251,706).” is incorrect, and should be deleted from lines 5-6 of the paragraph.

### **(7) Claims Appendix**

The copy of the appealed claims contained in the Appendix to the brief is correct.

### **(8) Evidence Relied Upon**

6,140,141     Davidson     10-2000

6,251,706     Paniccia     6-2001

### **(9) Grounds of Rejection**

The following ground(s) of rejection are applicable to the appealed claims:

1.        Claims 3, 4, 7, 9, 10, and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 6,140,141 to Davidson in view of U.S. Patent 6,251,706 to Paniccia.

Davidson discloses a system comprising:

a duct adapted to be coupled with an electronic device, wherein the duct forms one side of the duct;

a coolant flowing through the duct so as to cool the electronic device; and

a photon detector (radiation detector 145) located adjacent to the duct for detecting photons emitted from the electronic device;

wherein the duct and coolant are at least partially transparent to photons with wavelengths above 3.6 microns (greater or equal to 1 micron, see column 2, lines 58-60); the coolant is either water or a perfluorocarbon; the duct comprises a window; and the device includes a protecting outer layer (is packaged) (see figures 2 and 3; column 2, line 30-column 3, line 2; and column 3, lines 39-49).

Furthermore, Davidson discloses that photon detector detects the photons from the device during operation of the device under conditions for which the device is designed, and uses the detected photons to determine the voltages of the device.

Davidson does not disclose the duct being made of at least one of polished silicon, quartz, sapphire, glass, and diamond; and the system comprising a processor coupled to the photon detector for generating a thermal distribution of the device based on the information from the photon detector, wherein the photon detector captures thermal information from the device during operation of the device under conditions for which it is designed, the photon detector being an IR camera.

However, Paniccia discloses a system for testing an electronic device during operation by detecting photons (IR radiation) from the device through an IR-transparent window (520) made of diamond, silicon, or sapphire that is coupled to the device (502). The material of the window is thermally conductive, and is chosen depending on the heat removal requirements of the device (see column 5, lines 51-65). A photon detector comprising an IR camera (760) is located adjacent the device to detect the photons emitted by the device for use by its processor in generating a thermal distribution (thermal map) of the device, the camera capturing thermal information from the device

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during operation of the device under conditions for which the device is designed.

Paniccia discloses that it is known in the art to determine the voltage levels of the device as well as thermal information of the device by detecting photon emissions from the device when testing the device at its operating capacity, and that the IR camera (760) of his embodiment can determine the voltage levels of the device as well as thermal information. The thermal information is important since it allows proper thermal regulation of the device to prevent thermal degradation (see figure 7D; column 1, line 66-column 2, line 9; column 2, lines 26-35 and 43-55; and column 7, lines 13-37).

Referring to claim 7, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the system disclosed by Davidson by replacing the window with a window as taught by Paniccia, in order to provide a window having a desired thermal conductivity to remove heat depending on the heat removal requirements of a particular application, and since the particular type of material used to make the window is only considered to be the use of a “preferred” or “optimum” material out of a plurality of well known materials that a person having ordinary skill in the art at the time the invention was made would have been able to provide based on the intended use of Appellant’s apparatus, i.e., suitability for the intended use of appellant’s apparatus, which in this case is to provide a window that is partially transparent to photons with wavelengths above 3.6 microns, as taught by Davidson and Paniccia. See *In re Leshin*, 125 USPQ 416 (CCPA 1960), where the courts held that a selection of a material on the basis of suitability for intended use of an apparatus would be entirely obvious.

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Referring to claims 3, 9, and 10, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the system disclosed by Davidson and Paniccia by replacing the photon detector with a photon detector as taught by Paniccia, in order to also determine the thermal characteristics and generate a thermal map of the device from the detected photons to prevent thermal degradation.

2. Claims 5 and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Davidson and Paniccia, as applied to claims 3, 4, 7, 9, 10, and 29 above, and further in view of U.S. Patent 5,349,499 to Yamada et al [hereinafter Yamada].

Davidson and Paniccia disclose a system having all of the limitations of claims 5 and 6, as stated above in paragraph 1, but is silent as to the type of perfluorocarbon used, and therefore does not explicitly disclose the coolant being one of alkanes and perfluoroalkanes, or one of perfluorooctane, perfluorohexane, octane, hexane, and carbon tetrachloride.

However, Yamada discloses that perfluorooctanes and perfluorohexanes are known perfluorocarbons used as liquid coolants for semiconductor devices, and that other perfluorocarbons having the formula  $C_nF_{n+2}$  are also useful as liquid coolants for cooling electronic devices (see column 1, line 58-column 2, line 2; and claim 9).

Referring to claim 5, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the system disclosed by Davidson and Paniccia by using perfluoroalkanes as the liquid coolant since perfluoroalkanes have a molecular formula of  $C_{24}F_{50}$ , and Yamada teaches that perfluorocarbons having the

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molecular formula  $C_nF_{n+2}$  are useful as liquid coolants for use in cooling electronic devices.

Referring to claim 6, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the system disclosed by Davidson and Paniccia by using perfluorooctanes or perfluorohexanes as the perfluorocarbon, since Yamada teaches that these are known useful liquid coolants for use in cooling electronic devices.

3. Claims 15, 16, 19, 21, 22, and 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Davidson in view of Paniccia.

Davidson discloses a method for detecting photons (IR radiation) of an electronic device during operation, the method comprising:

detecting photons from an electronic device during operation of the electronic device using a photon detector (IR radiation detector 145), and the photon detector is adjacent to a duct comprising a window that is adjacent to the electronic device;

wherein the photons are indicative of a thermal characteristic of the electronic device (infrared radiation is thermal radiation and therefore indicative of temperature); the electronic device forms one side of the duct and a coolant comprising water or a perfluorocarbon flows through the duct so as to cool the electronic device; the duct and the coolant are at least partially transparent to photons with wavelengths above 3.6 microns (greater or equal to 1 micron, see column 2, lines 58-60); the photon detector captures the photons from the device during operation of the device under conditions for

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which it is designed; and the device includes a protecting outer layer (is packaged) (see figures 2 and 3; column 2, line 30-column 3, line 2; and column 3, lines 39-49).

Davidson discloses the method using the detected photons to determine the voltages of the device, but does not disclose the photons being used to detect a thermal characteristic of the device; the duct being made of at least one of polished silicon, quartz, sapphire, glass, and diamond; generating a thermal distribution of the device based on information from the photon detector; and the photon detector being an IR camera.

However, Paniccia discloses a system for testing an electronic device during operation by detecting photons (IR radiation) from the device through an IR-transparent window (520) made of diamond, silicon, or sapphire that is coupled to the device (502). The material of the window is thermally conductive, and is chosen depending on the heat removal requirements of the device (see column 5, lines 51-65). A photon detector comprising an IR camera (760) is located adjacent the device to detect the photons emitted by the device for use in generating a thermal distribution (thermal map) of the device, the camera capturing thermal information from the device during operation of the device under conditions for which the device is designed. Paniccia discloses that it is known in the art to determine the voltage levels of the device as well as thermal information of the device by detecting photon emissions from the device when testing the device at its operating capacity, and that the IR camera (760) of his embodiment can determine the voltage levels of the device as well as thermal information. The thermal information is important since it allows proper thermal regulation of the device to prevent

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thermal degradation (see figure 7D; column 1, line 66-column 2, line 9; column 2, lines 26-35 and 43-55; and column 7, lines 13-37).

Referring to claim 19, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the method disclosed by Davidson by replacing the photon detector with a photon detector as taught by Paniccia in order to also determine the thermal characteristics and generate a thermal map/distribution of the device from the detected photons to prevent thermal degradation.

Furthermore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the method disclosed by Davidson by replacing the window with a window as taught by Paniccia, in order to provide a window having a desired thermal conductivity to remove heat depending on the heat removal requirements of a particular application, and since the particular type of material used to make the window is only considered to be the use of a “preferred” or “optimum” material out of a plurality of well known materials that a person having ordinary skill in the art at the time the invention was made would have been able to provide based on the intended use of appellant’s apparatus, i.e., suitability for the intended use of appellant’s apparatus, which in this case is to provide a window that is partially transparent to photons with wavelengths above 3.6 microns, as taught by Davidson and Paniccia. See *In re Leshin*, 125 USPQ 416 (CCPA 1960), where the courts held that a selection of a material on the basis of suitability for intended use of an apparatus would be entirely obvious.

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4. Claims 17 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Davidson and Paniccia, as applied to claims 15, 16, 19, 21, 22, and 30 above, and further in view of Yamada.

Davidson and Paniccia disclose a method having all of the limitations of claims 17 and 18, as stated above in paragraph 3, but are silent as to the type perfluorocarbon used, and therefore do not explicitly disclose the coolant being one of alkanes and perfluoroalkanes, or one of perfluorooctane, perfluorohexane, octane, hexane, and carbon tetrachloride.

However, Yamada discloses that perfluorooctanes and perfluorohexanes are known perfluorocarbons used as liquid coolants for semiconductor devices, and that other perfluorocarbons having the formula  $C_nF_{n+2}$  are also useful as liquid coolants for cooling electronic devices (see column 1, line 58-column 2, line 2; and claim 9).

Referring to claim 17, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the method disclosed by Davidson and Paniccia by using perfluoroalkanes as the liquid coolant since perfluoroalkanes have a molecular formula of  $C_{24}F_{50}$ , and Yamada teaches that perfluorocarbons having the molecular formula  $C_nF_{n+2}$  are useful as liquid coolants for use in cooling electronic devices.

Referring to claim 18, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the method disclosed by Davidson and Paniccia by using perfluorooctanes or perfluorohexanes as the perfluorocarbon, since

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Yamada teaches that these are known useful liquid coolants for use in cooling electronic devices.

#### **(10) Response to Argument**

Appellant's arguments that there is no reason to combine Davidson with Paniccia because Davidson is not directed to measuring thermal distributions of chips (pages 8-9), and because Paniccia does not show or suggest a window that is part of a cooling system that uses coolant flowing through a duct so as to cool an electronic device (page 8-10) and a duct with coolant flowing through it (page 9) are not persuasive because one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). In this case, Davidson is not relied upon in the rejections for teaching measuring thermal distributions, and Paniccia is not relied upon in the rejections for teaching a cooling system that uses coolant flowing through a duct.

Appellant's arguments (page 9) that there is no reason to take the IR transparent window material from Paniccia and exchange it for the upper window of a cooling duct in Davidson, or modify Paniccia in view of Davidson, are not persuasive because the rejections are not based on replacing the material of the Paniccia window with the material of the Davidson window. Instead, the rejections are based on replacing the material of Davidson's window with a material as taught by Paniccia, i.e., modifying Davidson in view of Paniccia.

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Appellant's arguments (pages 10-11) that the combination of Davidson and Paniccia will render Davidson's device inoperable because Davidson will no longer be able to measure voltages are not persuasive since the Davidson device will still be able to obtain the voltage measurements when modified with Paniccia, as stated in the rejections, since Paniccia's device (page 6) measures both voltage and a thermal distribution of a chip.

Appellant's arguments (page 11) that there is no reason to take the IR transparent window material from Paniccia and exchange it for the upper window of a cooling duct in Davidson, or modify Paniccia in view of Davidson, are not persuasive because the rejections are not based on replacing the material of the Paniccia window with the material of the Davidson window. Instead, the rejections are based on replacing the material of Davidson's window with a material as taught by Paniccia, i.e., modifying Davidson in view of Paniccia.

Appellant's arguments that Davidson measures the intensity of near-IR radiation, and discloses materials (fused quartz and BK7 glass) for the window that are not transparent to wavelengths above 3.6 microns are not persuasive because Davidson states that the materials for the window are transparent to radiation having a wavelength of about 1 micron or more (see column 2, lines 58-61), which includes the wavelength range claimed by Appellant.

#### **11) Related Proceeding(s) Appendix**

No decision rendered by a court or the Board is identified by the Examiner in the Related Appeals and Interferences section of this Examiner's answer.

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For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

/Mirellys Jagan/

Examiner, Art Unit 2855

/Lisa M. Caputo/

Supervisory Patent Examiner, Art Unit 2855

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